IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Inventor: David Stevenson Spain Jr.

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Docket No.: 465-009US

Title: Location Estimation of Wireless Terminals Through Pattern Matching of Deduced Signal Strengths

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

APPEAL BRIEF UNDER 37 CFR 41.67

Pursuant to 37 CFR 41.67, this brief is filed in support of the appeal in this application.

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REAL PARTY IN INTEREST

The real party of interest in this application is the assignee of this application: Polaris Wireless, Inc., which is a Delaware corporation and which has its principal place of business in Santa Clara, California. The attorneys for this Appeal, DeMont & Breyer, LLC, have an equity interest in the assignee of this application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-28 stand rejected and are being appealed.

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to radio navigation in general, and, in particular, to a technique for determining the latitude and longitude of a "wireless terminal" (*e.g.*, a cell phone, a WiFi device, *etc.*). An understanding of the present invention and the prior art requires some context and a little familiarity with radio navigation, and, therefore, some background information is presented.

Figure 1 depicts a map of geographic region 120 which depicts a wireless telecommunications system that provides wireless telecommunications service to wireless terminal 101. (Applicants' Specification [0004] and Figure 1)

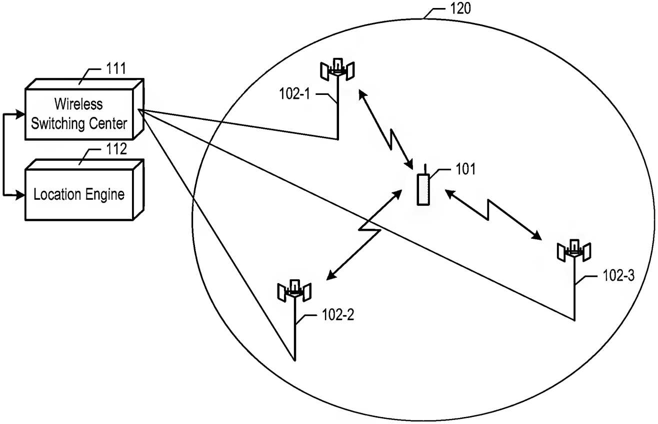

Figure 1 — Map of Region 120

The present invention is intended to be used with both the familiar cellular telephone and also with non-cellular terminals (*e.g.*, WiFi and Bluetooth devices, SMR terminals, *etc.*) and that is why the terms "wireless terminal" and "wireless telecommunications system" are

used in this application instead of the more familiar terms "cellular phone" and "cell phone system."

The heart of the telecommunications system is wireless switching center 111. Wireless switching center 111 is connected to a plurality of base stations (*e.g.*, base stations 102-1, 102-2, and 102-3), which are dispersed throughout geographic region 120. (Applicants' Specification [0004] and [0005])

As is well known to those skilled in the art, wireless switching center 111 is responsible for, among other things, establishing and maintaining calls between wireless terminals and between a wireless terminal and a wireline terminal (which is connected to the system via the local and/or long-distance telephone networks and which are not shown in Figure 1). (Applicants' Specification [0006])

The salient advantage of wireless over wireline telecommunications lies is in the mobility that is afforded to the user of the wireless terminal. On the other hand, the salient disadvantage of wireless telecommunications lies in that fact that because the user is mobile, an interested party might not be able to readily ascertain where the user is. (Applicants' Specification [0007])

Such interested parties might include both the user of the wireless terminal and remote parties. There are a variety of reasons why the user of a wireless terminal might be interested in knowing his or her own location. For example, the user might be interested in telling a remote party where he or she is, or in getting directions from where he or she is to another location. (Applicants' Specification [0008])

There are a variety of reasons why a remote party might be interested in knowing the location of the user. For example, the recipient of a 911 emergency call from a wireless terminal might be interested in knowing the location of the wireless terminal so that emergency services vehicles can be dispatched to that location. (Applicants' Specification [0009])

There are three classes of techniques for estimating the location of a wireless terminal:

i. Triangulation,

ii. Trilateralization, and

iii. Pattern-Matching.

The present invention uses pattern matching, and the relevant prior art uses a combination of all three techniques. Each of these will be discussed in turn.

Triangulation — In accordance with triangulation, the location of the wireless terminal is estimated based on the **direction** of the wireless terminal from three or more base stations whose latitude and longitude are known. This is depicted in Figure 2.

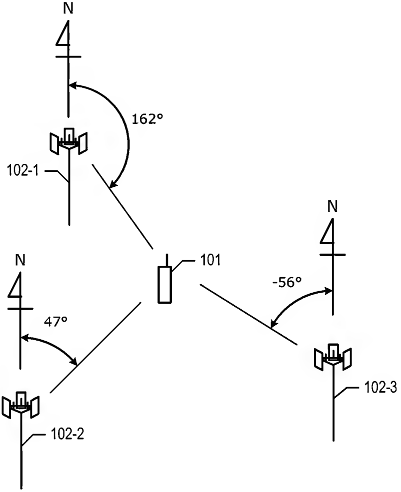

Figure 2 – Location of Wireless Terminal Based on Triangulation

To perform triangulation, the direction from each base station to the wireless terminal must be determined. How is this done? Typically, the directions are determined by directional antennas at the base stations.

There are many flavors of triangulation but, in general, it is not accurate enough for applications that require high accuracy (*e.g.*, 911 calls, *etc.*). Furthermore, triangulation is very expensive because it requires that directional antennas be placed at the base stations. (Applicants' Specification [0011])

<u>Trilateralization</u> — In accordance with trilateralization, the location of the wireless terminal is estimated based on the **<u>distance</u>** between the wireless terminal and three or more the base stations whose latitude and longitude are known. This is depicted in Figure 3.

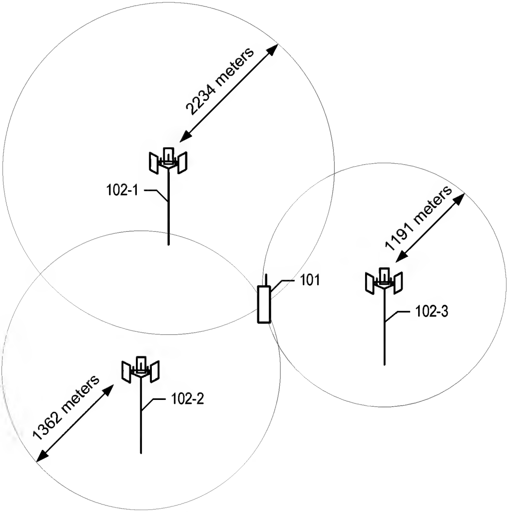

Figure 3 – Location of Wireless Terminal Based on Trilateralization

Trilateralization is similar to triangulation in the sense that both are based on vectors between the base station and the wireless terminal, but triangulation is based on the <u>direction</u> portion of the vector whereas trilateralization is based on the <u>magnitude</u> portion of the vector.

To perform trilateralization, the distance between each base station and the wireless terminal must be determined. How is this done? There are two ways: one is based on the

time it takes a signal to traverse the path between the base station and the wireless terminal, and the second is based on how much signal attenuation there is in the path between the base station and the wireless terminal. (Applicants' Specification [0011])

Trilateralization Based on Time - Trilateralization based on time is based on the fact that the amount of time it takes a radio signal to propagate from the transmitter to the receiver is a function of distance. In other words, if you know how long it takes a radio signal to propagate from the transmitter to the receiver, and you know the speed of propagation, you can easily calculate the distance between the transmitter and the receiver.

In free space, where there is an obstacle-free line-of-sight between the transmitter and the receiver, this technique is very accurate. How is the propagation time determined? In the case of modern cellular systems, the propagation time can be determined from:

(1) the time that it takes a signal to travel from the base station to the cell phone (which is known as the "forward" or "downlink" signal as shown in Figure 4), or
(2) the time that it takes a signal to travel from the cell phone to the base station (which is known as the "reverse" or "uplink" signal), or
(3) both the forward link and the reverse link (*i.e.*, one-half of the combined round-trip time).

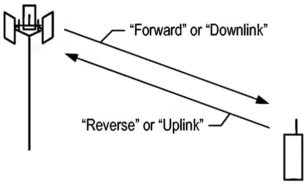

Figure 4 – Forward and Reverse Signals

But when — as in the case of modern cellular systems — there are radio frequency obstacles that reflect, refract, and absorb the signal and prevent an obstacle-free line-of-sight between the transmitter and the receiver, this technique is not accurate enough for many applications.

It should be noted that GPS uses trilateralization based on time and GPS requires an obstacle-free line-of-sight between the GPS receiver and the GPS satellites in orbit. When

it works, GPS is accurate to within meters and is advantageous in that it does not require that additional hardware be added to the telecommunication system's base stations or wireless switching center. GPS is disadvantageous, however, in that it does not work indoors or in dense urban areas (because the signals are blocked and reflected and refracted by buildings) and it cannot be used with legacy wireless terminals that do not comprise a GPS receiver. (Applicants' Specification [0013])

Trilateralization Based on Signal Attenuation — Trilateralization based on signal attenuation is based on the fact that the strength of a radio wave decays as a function of the square of the distance from the transmitter. Such a relationship is depicted in Figure 5. (Applicants' Specification Figure 7a)

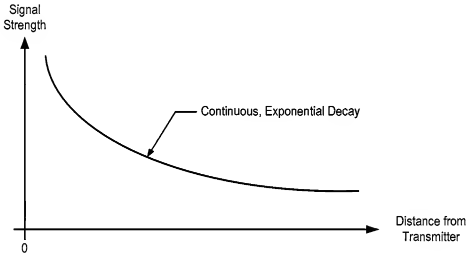

Figure 5 – Signal Strength Decay in Free-Space Environment Without RF Obstacles (Correlation Between Attenuation and Distance Exists)

If you know the strength of the signal at the transmitter and the strength of the signal at the receiver, the difference is the attenuation and from that you can easily calculate the distance between the transmitter and the receiver.

In free space, where there is an obstacle-free line-of-sight between the transmitter and the receiver, this technique is very accurate. How is the signal attenuation determined? In the case of modern cellular systems, the signal attenuation can be determined from:

(1) the attenuation in a forward or "downlink" signal, or

(2) the attenuation in a reverse or "uplink" signal, or

(3) a function (*e.g.*, the average, *etc.*) of <u>both</u> the forward <u>and</u> the reverse signal.

But when — as in the case of modern cellular systems — there are radio frequency obstacles that reflect, refract, and absorb the signal and prevent an obstacle-free line-of-sight between the transmitter and the receiver, this technique is not accurate enough for many applications because the straightforward correlation between attenuation and distance is destroyed. This is shown in Figure 6. (Applicants' Specification Figure 7b)

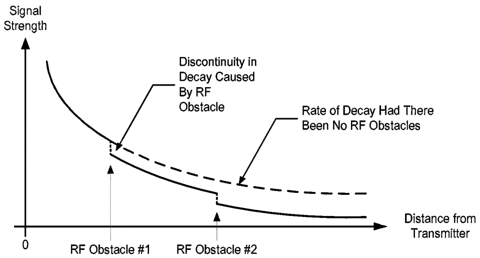

Figure 6 – Signal Strength Decay in Environment with RF Obstacles (Correlation Between Attenuation and Distance is Destroyed)

<u>Pattern-Matching</u> — The pattern matching class of techniques is based on the fact that as the wireless terminal moves from location to location, it:

(1) "sees" differences in the RF environment that are a causal and deterministic function of its location, <u>and</u>

(2) it causes changes in the RF environment <u>at the base stations</u> that are a causal and deterministic function of its location.

In other words, and with reference to Figure 7, as the wireless terminal moves from location to location:

(1) the wireless terminal can measure traits of the forward or "downlink" signals from the base stations that vary in a causal and deterministic function of its location, <u>and</u>

(2) the base stations can measure traits of the reverse or "uplink" signals that vary in a causal and deterministic function of the wireless terminal's location.

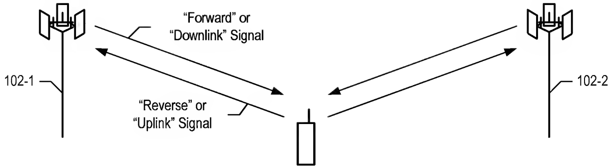

Figure 7 – Changes in Location of Wireless Terminal Affect Both What Wireless Terminal Sees of RF Environment in Its Vicinity and What Base Stations See in Their Vicinity

Given this fact, the location of the wireless terminal can be estimated by comparing traits of the RF environment when the wireless terminal is at an unknown location with traits of the RF environment when the wireless terminal is at one or more known locations. When the observed traits match the traits at a known location, you can reasonably surmise that the wireless terminal is at that location.

Using pattern matching to locate a wireless terminal is more or less analogous as a simple example will illustrate.

Suppose that a signal from Base Station A is known to be received at Location 1 with a strength of -65 dBm, at Location 2 with a strength of -98 dBm, at Location 3 with a strength of -77 dBm, and at Location 4 with a signal strength of -79 dBm, as depicted in Table 1.

	Strength of Signal from Base Station A	**Strength of Signal from Base Station B**
Location 1	-65 dBm	-92 dBm
Location 2	-98 dBm	-46 dBm
Location 3	-77 dBm	-55 dBm
Location 4	-79 dBm	-29 dBm

Table 1 – Illustrative Signal Strength Database

Suppose also that a signal from Base Station B is known to be received at Location 1 with a strength of -92 dBm, at Location 2 with a strength of -46 dBm, at Location 3 with a strength of -55 dBm, and at Location 4 with a signal strength of -29 dBm, as depicted in Table 1.

When a wireless terminal at one of these locations receives the signal from Base Station A with a strength of -67 dBm, the pattern matching technique can reasonably estimate that the wireless terminal is most likely at Location 1.

Note that pattern matching is fundamentally different from either triangulation or trilateralization in that no assumption is made regarding line-of-sight propagation or the presence or absence of RF obstacles and there is no attempt to estimate the distance to or direction of the transmitter.

All that is required for pattern matching is that:

(1) there is knowledge of the signal strength at each location,

(2) the wireless terminal is able to accurately measure signal strength, and

(3) *there is a significant difference in the signal strength at the each location*.

This last requirement is the one of interest to the present invention and warrants further discussion.

If the signal strength of the signal is not significantly different at two or more locations, then the likelihood that the wireless terminal is at each of those locations is a tie. For example, if a wireless terminal at one of the above four locations receives the signal from Base Station A with a strength of -78 dBm, the likelihood that it is at Location 3 or Location 4 is a tie. And how do we break a tie? By considering an additional signal whose signal strength is significantly different at the locations where the first signal is not significantly different. Therefore, if a wireless terminal at one of the above four locations receives the signal from Base Station A with a strength of -78 dBm and the signal from Base Station B with a strength of -31 dBm, the pattern matching technique can reasonably estimate that the wireless terminal is most likely at Location 4. The fact that the signal from Base Station B is used improves the accuracy of the estimate from the other signals, and, in fact, the more signals that are considered, the better.

So, now that we know that we need signal strength measurements — and as many of them as possible — where can we get them? In accordance with most cellular telephone systems, the cell phone itself measures the strength of six signals. If we could get more, that would be great, but it is not possible to get legacy wireless terminals to measure more than six signals.

But — <u>and here is the invention</u> — the value of a signal-strength measurement for one more signal — <u>a 7th signal</u> — can be *<u>logically deduced</u>* from other information available to the wireless system even though it is <u>not</u> actually measured.

<u>But what signal can we "pretend" to measure that isn't already measured?</u> — For reasons that are beyond the scope of the present discussion — a cell phone does <u>not</u> measure the signal strength of the signal coming from the base station that is <u>providing cellular service</u> to the cell phone. The six signal-strength measurements that the wireless terminal does make are for signals coming from the <u>other</u> base stations — base stations the wireless terminal might be handed off to. And since the wireless terminal cannot be handed off to its serving base station, it does not measure the signal strength of the signal coming from that base station.

<u>From what information is the deduction made and how can the deduction be made?</u> — The invention deduces the signal strength of the serving base station's signal at the wireless terminal, R_D, based on the principal of reciprocity. The principal of reciprocity states that the attenuation of a signal transmitted from Point A to Point B is the same as that for that signal as transmitted from Point B to Point A. (Applicants' Specification [0022])

In other words, the signal strength of the serving base station's signal at the wireless terminal, R_D, can be deduced from the strength at which the signal is transmitted by the base station, T_D, and the attenuation of that signal between the base station and the wireless terminal, A_D, by the function:

$$R_D = T_D - A_D \qquad \text{(Eq. 1)}$$

The principal of reciprocity indicates that the attenuation of the signal between the base station and the wireless terminal, A_D, equals the attenuation of that signal between the wireless terminal and the base station, A_U, as represented by Equation 2:

$$A_D = A_U \qquad \text{(Eq. 2)}$$

The attenuation of the signal between the wireless terminal and the base station, A_U, is equal to the strength at which the signal is transmitted by the wireless terminal, T_U, minus the signal strength of the signal as measured by the base station, R_U, as represented by Equation 3:

$$A_U = T_U - R_U \qquad \text{(Eq. 3)}$$

By substituting Equation 3 into Equation 2 and Equation 2 into Equation 1, the signal strength of the serving base station's signal at the wireless terminal, R_D, can be <u>deduced</u>

from the strength at which the signal is transmitted by the base station, T_D, the strength at which the signal is transmitted by the wireless terminal, T_U, and the signal strength of the signal as measured by the base station, R_U, as represented by Equation 4:

$$R_D = T_D - (T_U - R_U) \qquad \text{(Eq. 4)}$$

And voila! The deduced value of R_D is equal to the 7th signal-strength measurement and can be used to estimate the location of the wireless terminal in exactly the same way as if it were directly measured. (Applicants' Specification [0027])

GROUNDS OF OBJECTION AND REJECTION TO BE REVIEWED ON APPEAL

Ground 1: 35 U.S.C. 103 Rejection of Claims 1-4, 6-7, 10-13, 15-16, 20 -23, 25-26

Claims 1-4, 6-7, 10-13, 15-16, 20 -23, 25-26 were rejected under 35 U.S.C. 103(a) as being anticipated by as being obvious in light of R. Rotstein, et al., U.S. Patent Application Publication 2004/0057507 A1 (hereinafter "Rotstein") as modified by B.H. Chen, et al., U.S. Patent 6,658,258 B1 (hereinafter "Chen"). The applicants respectfully traverse the rejection.

Ground 2: 35 U.S.C. 103 Rejection of Claims Claims 5, 14, 19, and 24

Claims 5, 14, 19, and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rotstein in view of D.J. Dupray, U.S. Patent 6,249,252 (hereinafter "Dupray"). The applicants respectfully traverse the rejection.

Ground 3: 35 U.S.C. 103 Rejection of Claims Claims 8, 17, and 27

Claims 8, 17, and 27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rotstein in view of Chen in K. Okanoue et al., U.S. Patent Application 2003/0064733 A1 (hereinafter "Okanoue"). The applicants respectfully traverse the rejection.

Ground 4: 35 U.S.C. 103 Rejection of Claims Claims 9, 18 and 28

Claims 9, 18 and 28 were rejected under 35 U.S.C. 103(a) as being unpatentable Rotstein in view of Dupray in further view of Okanoue. The applicants respectfully traverse the rejection.

ARGUMENTS

Ground 1: Rejection of Claims 1-4, 6-7, 10-13, 15-16, 20 -23, 25-26

35 U.S.C. 103 Rejection of Claims 1-4, 6-7, 10-13, 15-16, 20 -23, 25-26

Claims 1-4, 6-7, 10-13, 15-16, 20 -23, 25-26 were rejected under 35 U.S.C. 103(a) as being anticipated by as being obvious in light of R. Rotstein, et al., U.S. Patent Application Publication 2004/0057507 A1 (hereinafter "Rotstein") as modified by B.H. Chen, et al., U.S. Patent 6,658,258 B1 (hereinafter "Chen"). The applicants respectfully traverse the rejection.

Claim 1 recites:

> **1.** A method comprising:
>
> *deducing a signal strength of a first signal, R_D, at a wireless terminal based on a transmit strength of a second signal, T_U, that is transmitted by said wireless terminal*; and
>
> estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.
>
> (*emphasis supplied*)

Nowhere does Rotstein teach or suggest, alone or in combination with the other references, what claim 1 recites – namely determining the signal strength of a first signal at a wireless terminal based on the transmit strength of a second signal transmitted by the wireless terminal.

In substantiating the rejection, the Office is employing a "kitchen sink" attack wherein a long reference that uses some of the same words and phrases as are in the claims is deemed to anticipate the limitations claims. The Office cites into portions of the reference that comprise almost 1000 words without ever mapping the limitations in the claim to the particular elements in the reference.

Regardless, a careful reading of the cited portions of Rotstein makes clear that the reference fails to teach or suggest what is recited.

The first cited portion of Rotstein is Paragraph [0007]:

> [0017] The MS 104 receives the message 300 at a given power 206, which may be different than the transmit power level 202 used by the AP 102 to transmit the message 300 over the communication link 106. Upon receipt of the message 300, the MS 104 identifies, from the message 300, the

> transmit power level 202 used by the AP 102 to transmit the message 300 and the interference level 204 perceived locally by the AP 102. Based on the transmit power level 202 used by the AP 102, the receive power level 206, the interference level perceived by the AP 102, and the interference level 208 perceived locally by the MS 104, the MS 104 ***deduces*** the "link path loss" and calculates at least one optimal transmission parameter (e.g., a transmit power level, a data rate, a modulation format, a modulation mode, error correction, spreading, coding, etc.) by which a response message will be transmitted to the AP 102. It is important to note that the transmit power level 202 used by the AP to transmit the message 300 is not necessarily the same as the receive power level 206 as received by the MS 104; moreover, the interference level 204 perceived locally by the AP 102 is not necessarily the same as the interference level 208 perceived locally by the MS 104.
>
> (***emphasis supplied***)

The first cited portion of Rotstein is useable to teach that signals can be transmitted and received, and that signals have signal strength, and that transmission paths have path losses, and that some signal properties can be "deduced" from other signal properties with algebraic manipulation.

Nowhere, however, does this portion of Rotstein teach or suggest what claim 1 recites — namely, determining the signal strength of a first signal at a wireless terminal based on the transmit strength of a second signal transmitted by the wireless terminal.

This second cited portion of Rotstein is Paragraph [0020]:

> [0020] The AP 102 receives the response message at a given power 210, which may be different than the transmit power level 212 used by the MS 104 to transmit the response message over the communication link 106. Upon receipt of the response message, the AP 102 identifies the transmit power level 212 used by the MS 104 to transmit the response message, and the interference level 208 perceived locally by the MS 104 from the response message. Based on the transmit power level 212 used by the MS 104, the receive power level 210, the interference level 208 perceived locally by the MS 104, and the interference level 204 perceived locally by the AP 102, the AP 102 ***deduces*** the "link path loss" and calculates at least one optimal transmission parameter (e.g., a transmit power level, a data rate, a modulation format, a modulation mode, error correction, spreading, coding, etc.) by which a subsequent message will be transmitted to the MS 104. It is important to note that the transmit power level 212 used by the MS 104 to transmit the response message is not necessarily the same as the receive power level 210 as received by the AP 102; moreover, the interference level 208 perceived locally by the MS 104 is not necessarily the same as the interference level 204 perceived locally by the AP 102.
>
> (***emphasis supplied***)

This portion of Rotstein also teaches that some signal properties can be "deduced" from other signal properties with algebraic manipulation. It does not, however, teach what is claimed.

The final portion of Rotstein is Paragraphs [0029]-[0050]:

> [0029] When the power meter 518 receives the digital signals 506, the power meter 518 estimates the total received power 206 at the MS 104. This estimated received power 206 could be expressed as:
>
> $$P_{RX} = P_{TX} x L_P + I_{MP} + I_{OC} + N_O$$
>
> [0030] where:
>
> [0031] P_{Rx} is the total estimated receive power as perceived by the MS;
>
> [0032] P_{Tx} is the transmit power as defined by the AP;
>
> [0033] L_p is the path loss;
>
> [0034] I_{MP} is the multipath induced interference;
>
> [0035] I_{OC} is the interference induced by adjacent transmitting devices; and
>
> [0036] N_o is the thermal noise.
>
> [0037] Taking into account that the multipath interference is proportional to the transmit power 202 as defined by the AP 102; the total received power 206 becomes a function of the transmit power 202 and environmental interference 208:
>
> $$P_{RX} = P_{TX} x (L_P + L_{MP}) + (I_{OC} + N_O) \text{ or}$$
>
> $$P_{RX} = P_{TX} x L_T + I$$
>
> [0038] where:
>
> [0039] P_{Rx} is the total estimated receive power as perceived by the MS;
>
> [0040] P_{Tx} is the transmit power as defined by the AP;
>
> [0041] L_p is the path loss;
>
> [0042] L_{MP} is the multipath path loss;
>
> [0043] I_{OC} is interference induced by adjacent transmitting devices;
>
> [0044] N_o is the thermal noise;
>
> [0045] L_T is the total path loss; and
>
> [0046] I is the total interference as perceived by the MS.

[0047] Given that the link is time division multiplexed between multiple users, a continuous scan of the communication link 106 yields the total interference, I, by monitoring the lowest absolute receive power 206 as perceived by the MS 104 over time.

$$I = \min_{\text{time\_interval}}(P_{RX})$$

[0048] The total interference, I, is the power received by the MS 104 when the AP 102 and all other MSs in communication with the MS 104 are silent (i.e., the quiet period). In the preferred embodiment, the AP may optionally schedule at least one quiet period where all the devices are required to be silent and measure their local interference level.

[0049] Once the total interference, I, is known, the MS 104 can deduce the communication link 106, L_T, by the following equation:

$$L_T = \frac{P_{RX} - I}{P_{TX}}$$

[0050] Knowing the communication link 106, L_T, is not sufficient for the MS 104 to define the correct transmit power 212 for the response message because the interference 204 perceived by the AP 102 may be different than the interference 208 perceived by the MS 104. To overcome the discrepancy in perceived interference levels, the AP 102 transmits its perceived local interference level 204 to the MS 104.

The final portion of Rotstein teaches the actual manipulation of signal properties with algebraic manipulation, but it also fails to teach what the Office asserts that it does.

The logic underlying the Office's position is that because the prior art teaches that the unknown physical quantities of a signal can be found — via "well-known" algebraic manipulation — from known quantities:

(1) it is obvious which unknown quantities are worth seeking,
(2) it is obvious how to use the unknown quantities, and
(3) it is obvious how to use algebra to turn known quantities into unknown quantities.

Clearly, this is wrong.

(1) Nowhere does Rotstein teach or suggest that the strength of a signal received at a wireless terminal is unknown and yet worth knowing.
(2) Nowhere does Rotstein teach or suggest what to do with the strength of the signal at the wireless terminal assuming it was known.

(3) Nowhere does Rotstein teach or suggest what algebraic manipulation can be used to find the strength of a signal <u>received</u> at a wireless terminal from the strength of a signal <u>transmitted</u> by the wireless terminal.

And because the Office admits that Chen fails to cure these deficiencies of Rotstein, the applicants respectfully submit that the rejection of claim 1 is traversed.

Because claims 2 through 4, 6, and 7 depend on claim 1, the applicants respectfully submit that the rejection of them is also traversed.

Claim 10 recites:

> **10.** A method comprising:
>
> *deducing a signal strength of a first signal, R_D, at a wireless terminal based on a signal-strength measurement of a second signal, R_U, at the location where said first signal is transmitted*; and
>
> estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.
>
> (*emphasis supplied*)

For the reasons given above with respect to claim 1, nowhere does Rotstein teach or suggest, alone or in combination with the other references, what claim 10 recites – namely *deducing a signal strength of a forward signal, R_D, at a wireless terminal based on a signal-strength measurement of an reverse signal, R_U* at the location where the forward signal, R_D, is transmitted.

For this reason, the applicants respectfully submit that the rejection of claim 10 is traversed.

Because claims 11 through 13, 15, and 16 depend on claim 10, the applicants respectfully submit that the rejection of them is also traversed.

Claim 20 recites:

> **20.** A method comprising:
>
> deducing a signal strength of a first signal, R_D, at a wireless terminal based on an attenuation of a second signal, A_U, that is transmitted by said wireless terminal; and
>
> estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.
>
> (*emphasis supplied*)

For the reasons given above with respect to claim 1, nowhere does Rotstein teach or suggest, alone or in combination with the other references, what claim 20 recites – namely

deducing a signal strength of a forward signal, R_D, at a wireless terminal based on an attenuation of a second signal, A_U, that is transmitted by said wireless terminal.

For this reason, the applicants respectfully submit that the rejection of claim 20 is traversed.

Because claims 21 through 23, 25, and 26 depend on claim 20, the applicants respectfully submit that the rejection of them is also traversed.

Ground 2: 35 U.S.C. 103 Rejection of Claims 5, 14, 19, and 24

Claims 5, 14, 19, and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rotstein in view of D.J. Dupray, U.S. Patent 6,249,252 (hereinafter "Dupray"). The applicants respectfully traverse the rejection.

Because claims 5, 14, 19, and 24 depend on claims 1, 10, and 20, respectively, and because Dupray fails to cure the deficiencies of Rotstein, the applicant respectfully submits that the rejection of claims 5, 14, 19, and 24 is traversed.

Ground 3: 35 U.S.C. 103 Rejection of Claims Claims 8, 17, and 27

Claims 8, 17, and 27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rotstein in view of Chen in K. Okanoue et al., U.S. Patent Application 2003/0064733 A1 (hereinafter "Okanoue"). The applicants respectfully traverse the rejection.

Because claims 8, 17, and 27 depend on claims 1, 10, and 20, respectively, and because Okanoue fails to cure the deficiencies of Rotstein, the applicant respectfully submits that the rejection of claims 8, 17, and 27 is traversed.

Ground 4: 35 U.S.C. 103 Rejection of Claims Claims 9, 18 and 28

Claims 9, 18 and 28 were rejected under 35 U.S.C. 103(a) as being unpatentable Rotstein in view of Dupray in further view of Okanoue. The applicants respectfully traverse the rejection.

Because claims 9, 18 and 28 depend on claims 1, 10, and 20, respectively, and because Dupray and Okanoue fail to cure the deficiencies of Rotstein, the applicant respectfully submits that the rejection of claims 9, 18 and 28 is traversed.

CONCLUSION

The applicants have demonstrated that the logic underlying the Office's rejection is untenable, and, therefore, that the rejection is not sustainable. For this reason, the applicants respectfully request the Board of Appeals to reverse the decision of the Examiner as provided for in 37 C.F.R. 41.50(a).

Respectfully,
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Claims Appendix

1. (original) A method comprising:

deducing a signal strength of a first signal, R_D, at a wireless terminal based on a transmit strength of a second signal, T_U, that is transmitted by said wireless terminal; and

estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.

2. (original) The method of claim 1 wherein deducing said signal strength of said first signal, R_D, is also based on a transmit strength of said first signal, T_D.

3. (original) The method of claim 1 wherein deducing said signal strength of said first signal, R_D, is also based on a signal-strength measurement for said second signal, R_U, at the location where said first signal is transmitted.

4. (original) The method of claim 1 wherein deducing said signal strength of said first signal, R_D, is also based on an attenuation for said second signal, A_U, between said wireless terminal and the location where said first signal is transmitted.

5. (original) The method of claim 1 wherein estimating the location of said wireless terminal comprises pattern matching said signal strength of said first signal, R_D, against a database that associates candidate locations for said wireless terminal with predicted signal-strength measurements for said first signal.

6. (original) The method of claim 1 wherein estimating the location of said wireless terminal is also based on a signal-strength measurement of a third signal, R_1, at said wireless terminal.

7. (original) The method of claim 6 wherein estimating the location of said wireless terminal is based on said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

8. (original) The method of claim 6 wherein estimating the location of said wireless terminal is based on the absolute magnitude of the difference between said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

9. (original) The method of claim 6 wherein estimating the location of said wireless terminal comprises generating a two-dimensional probability distribution for the location of said wireless terminal based on the absolute magnitude of the difference between said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

10. (original) A method comprising:

deducing a signal strength of a first signal, R_D, at a wireless terminal based on a signal-strength measurement of a second signal, R_U, at the location where said first signal is transmitted; and

estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.

11. (original) The method of claim 10 wherein deducing said signal strength of said first signal, R_D, is also based on a transmit strength of said first signal, T_D.

12. (original) The method of claim 10 wherein deducing said signal strength of said first signal, R_D, is also based on a transmit strength of said second signal, T_U, that is transmitted by said wireless terminal.

13. (original) The method of claim 10 wherein deducing said signal strength of said first signal, R_D, is also based on an attenuation for said second signal, A_U, between said wireless terminal and the location where said first signal is transmitted.

14. (original) The method of claim 10 wherein estimating the location of said wireless terminal comprises pattern matching said signal strength of said first signal, R_D, against a database that associates candidate locations for said wireless terminal with predicted signal-strength measurements for said first signal.

15. (original) The method of claim 10 wherein estimating the location of said wireless terminal is also based on a signal-strength measurement of a third signal, R_1, at said wireless terminal.

16. (original) The method of claim 15 wherein estimating the location of said wireless terminal is based on said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

17. (original) The method of claim 15 wherein estimating the location of said wireless terminal is based on the absolute magnitude of the difference between said signal

strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

18. (original) The method of claim 15 wherein estimating the location of said wireless terminal comprises generating a two-dimensional probability distribution for the location of said wireless terminal based on the absolute magnitude of the difference between said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

19. (original) The method of claim 10 further comprising removing the effects of fast fading on R_U.

20. (original) A method comprising:

deducing a signal strength of a first signal, R_D, at a wireless terminal based on an attenuation of a second signal, A_U, that is transmitted by said wireless terminal; and

estimating the location of said wireless terminal based on said signal strength of said first signal, R_D.

21. (original) The method of claim 20 wherein deducing said signal strength of said first signal, R_D, is also based on a transmit strength of said first signal, T_D.

22. (original) The method of claim 20 wherein deducing said signal strength of said first signal, R_D, is also based on a signal-strength measurement for said second signal, R_U, at the location where said first signal is transmitted.

23. (original) The method of claim 20 wherein deducing said signal strength of said first signal, R_D, is also based on a transmit strength of said second signal, T_U.

24. (original) The method of claim 20 wherein estimating the location of said wireless terminal comprises pattern matching said signal strength of said first signal, R_D, against a database that associates candidate locations for said wireless terminal with predicted signal-strength measurements for said first signal.

25. (original) The method of claim 20 wherein estimating the location of said wireless terminal is also based on a signal-strength measurement of a third signal, R_1, at said wireless terminal.

26. (original) The method of claim 25 wherein estimating the location of said wireless terminal is based on said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

27. (original) The method of claim 25 wherein estimating the location of said wireless terminal is based on the absolute magnitude of the difference between said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

28. (original) The method of claim 25 wherein estimating the location of said wireless terminal comprises generating a two-dimensional probability distribution for the location of said wireless terminal based on the absolute magnitude of the difference between said signal strength of said first signal, R_D, and said signal-strength measurement of said third signal, R_1.

Evidence Appendix

There is no evidence submitted pursuant to 37 CFR §§ 1.130, 1.131, or1.132.

Related Proceedings Appendix

There are no related proceedings.